

Comparison of load – deflection characteristics of nickel – titanium orthodontic wires

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Abstract

Background and Aim: Very often apparently similar nickel-titanium wires behave differently and this makes the selection of clinically proper wire very difficult. The aim of this study was to compare load-deflection characteristics of some super elastic nickel-titanium wires available in Iran's commercial field. We hoped the results would be helpful for clinicians in selecting the proper wire to be used in different situations.

Methods & Materials: This study was a descriptive and cross-sectional one. 10 types of super elastic nickel-titanium wires (5 of each) with 0/016 inch diameter were tested by three-bracket bending test at 27°C temperature. Hounsfield (H10KS) machine was used to deflect the wires. The cross-head speed was 0/5mm/min and force level was recorded in 0/25 mm intervals from passive to 3 mm deflection and then in unloading condition from 3 mm to the point that no force was detected (permanent set). Analysis of variance was used. Tukey analysis was done for comparison of each wire with other 9 wires.

Results: Although recorded curves were generally similar to typical curves of super elastic wires but their slopes were different. The recorded force levels in 1-1.5-2-2.5 mm deflection in the unloading curve showed statistically significant difference in force levels (P-value<0.001). Analysis of variance showed significant difference in force decay from 2/5 to 1mm deflection as well (P-value < 0.001). According to the findings the wires were divided into three groups of force level: light (Rematitan, Elastinol, Nitinol Sel, Global), medium (Chinese NiTi, Flex Medics, Force II, Nitanium) and heavy (Force I, Reflex TP). Moreover, it was found out that even the wires made by one factory were not the same. Among the tested wires the TP wires had minimum and the Global ones had maximum similarity to each other.

Conclusion: This study showed that only the word “superelastic” on the packages of nickel-titanium wires is not enough for using them for treating all kinds of crowdings. Attention should be paid to the results of the independent researches as well.

Key words: Ni-Ti wires, load-deflection rate, crowding